

The Uptake and Use of Digital Technologies in Two Schools Working in a 1:1 Computer Initiative

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Abstract. The use of digital technologies in schools provides possibilities and challenges in the classroom. The uptake and use of laptop computers and the conditions for Technology Enhanced Learning (TEL) in two schools will be studied in Unos Umeå, a joint One-to-One (1:1) initiative between Umeå University and the municipality of Umeå in Sweden. The research questions posed regard teachers' expectations regarding laptop use and professional development, students' expectations regarding use, expectations of school leaders and effects for the schools as organizations. Based on surveys, interviews, focus group interviews and ethnographically inspired classroom observations, the Ecology of Resources Model [14] is used as a theoretical framework. The research contribution of Unos Umeå will be of importance for schools initiating similar projects in the future, contributing to insight in development for teachers, students, school leaders, the schools as organizations as well as for the research areas of 1:1 and TEL.

Keywords: Digital technologies, 1:1, TEL, teachers, students.

1 Introduction

The shift towards techno-classrooms aspires to achieve Technology Enhanced Learning (TEL), meeting what appears to be a growing tendency of student disengagement and consequential educational failure [18] as well as improving student achievement [12]. As computers continue to increase in classrooms [33], the uptake and use of digital technologies such as laptop computers, tablets, interactive whiteboards and mobile phones offers possibilities and challenges for TEL. This brings forth new questions regarding learning practices for students and teachers in the context of school as an institution. The uptake of laptops in a school context of traditional classroom methods, such as lectures and pencil-and-notebook work, is perhaps the first step within a system that struggles to respond to technical change with limited resources and inherited skills [5]. However, technological change in the classroom will demand an integration of vision, experimentation and new roles and relationships for teachers and students [24]. For the Swedish school system, projects to increase Information and Communication Technology (ICT) in the classroom have been initiated by the Swedish National Agency for Education. The agency strongly recommends continued work in developing ICT-competence [16], suggesting that

digital competence is integrated into policy and curriculum documents in line with the European Union's intention of technology innovations as life-long learning for all [4] and as a means of increasing the large pedagogical potential in using ICT in schools [17]. One recent step of ICT-immersion is One-to-One (1:1) initiatives, involving the distribution of individual laptop computers to students and teachers, with municipalities in Sweden continuing to implement 1:1 projects.

2 Research in 1:1

Research in the 1:1 field is complex, broad and somewhat difficult to interpret. This is mainly the result of the definition of what a 1:1 project comprises; it can be small handheld computers, joint computers, computers without access to the Internet, etc. Given this complexity and the vast number of interpretations, it is still possible to conclude that much of the research which has been published can be said to be more evaluation-oriented than empirically-based and peer-reviewed in line with academic standards [20], [9]. Furthermore, studies can be based on motivational factors, learning results, effects on student and teacher collaboration, professional development for teachers as well as organization issues such as the role of the school leader as a pedagogical leader and policy implementation. Therefore, research in 1:1 not only includes several organizational levels on the vertical axel, it also includes the horizontal axel of learning practices in the classroom as well as learning theories all with the target of attempting to answer the questions how, what and why students and teachers learn in a digital classroom [19].

Results refer to computers in the classroom as being "oversold and underused" [2] with minimal effects on academic results [2]. Other studies report improved results in digital competence and writing [20]. However, academic results are only one part when attempting to measure improvement in learning environments. 1:1 efforts have shown that students gain an increased interest in learning, motivation and involvement [1]. One of the largest 1:1 projects was initiated in the state of Maine in the northeastern part of the US helped schools in integrating laptop technology into the learning processes, reporting that the student learning has improved [21] and continues to be successful [22].

Studies in the Swedish context [11], [29], [28], [10], are in line with international results. In a 1:1 study in two compulsory schools in the Swedish municipality of Falkenberg, teachers experienced their planning work to be more organized, the classroom calmer and information more easily accessed. Initially, teachers reported a more stressful work environment in the transition from traditional planning to computer-based planning. However, students' work proved to be better, with teachers noting better quality in texts and that the students wrote longer texts. A higher level of motivation as well as performance was also noted. From the students' perspective it was difficult to find any negative factors related to the 1:1 project. Students experienced better planning in their own work, found the classroom to be calmer and were happy to not have to wait to use a computer [29].

When computers are introduced in the classroom in a One-to One initiative, there are widespread changes in the competence of teachers [13]. This means that digital

technology in the classroom creates a number of professional development areas for teachers. Access to technical support, teacher collaboration, making instruction more individualized and appears to make the classroom more constructivistic [6]. If this is a result of the technology in itself or if it is a requirement for the implementation of technology is an issue which requires more research. Nonetheless, the integration, uptake and use of computers takes time. Teachers need time to discuss content, students' work, pedagogics and technology [7]. Professional development in this area requires a complex combination intertwining technical, pedagogical and subject-related didactic competences [15].

In summary the research, in line with ongoing studies in Unos Umeå, points towards the importance of the roles of teachers and school leaders, engaging students as well as the importance of IT-strategies which comprise more than just technology [26].

3 Aim of the study

A possibility to follow a 1:1 initiative and study the uptake and use of digital technologies in the classroom is the research project Unos Umeå. The 1:1 initiative started in 2011 as a joint project between the Department of Education at Umeå University and the municipality of Umeå in Sweden. The research project will follow this 1:1 initiative which involves two schools, one compulsory school and one upper-secondary school in Umeå, over a period of four years. The research project aspires to provide multifaceted and in-depth knowledge in the use of digital technologies in the classroom as well as how it affects the users and the organization itself over time, therefore offering insight into the sphere of TEL in education.

4 Research Questions

The aim of this 1:1 project is to observe, illustrate and examine how learning practices are affected by the uptake and use of digital technologies. The project seeks to examine how expectations and learning practices develop and transform over time with the focus on multiple organizational levels and with a longitudinal perspective. The following research questions are put forward:

- What are teachers' expectations regarding the uptake and use of digital technologies and what is expected in forms of learning practices for students as well as for their own professional development?
- What are students' expectations considering school results, school planning, motivation, involvement and the use of digital technologies?
- What insights may the expectations of school leaders provide regarding the uptake and use of digital technologies as well as the effects of the 1:1 initiative for creating learning practices in an organization of TEL for students and teachers?

- How is the school as an organization affected and what expectations and concerns do school leaders, teachers and students have in regard to the 1:1-initiative?

To this aim, there will be four studies which will focus on the expectations regarding the uptake and use of digital technologies on the teacher, student and school leader level. Lastly, as the central part of the dissertation summary, a literature review and document analysis of the uptake and use as seen in policy and curriculum in the EU, Scandinavia and Sweden will be carried out.

5 Theoretical Background

In order to understand how expectations, knowledges and practices develop within the classroom through the uptake and use of digital technologies the project will gain inspiration from the sociocultural perspective. According to the sociocultural perspective, human actions and activities are interpreted to be the source of determining how knowledge, ideas, and practices are incorporated and developed within a context and as an interaction between subject, object and mediating tools [30], [31], [8]. What is of interest to observe in this case is how individuals and groups within the digital classroom work together and with the tools, i.e. the processes that occur as computers are used in classroom work as mediating tools and how development collectively, through a dynamic process changes, develops and reproduces over time [30], [31], [8], [27].

A framework for examining and describing learning practices in the classroom is the Ecology of Resources model [14]. In the model, the learner is placed in the center of a circle surrounded by the three resource elements of *Environment*, *Knowledge and skills*, and *Tools and people*. Therefore, the model provides a holistic view of the learner including the resources available to the learner as well as the concept of *filters*, which can be said to restrain or impede the resources available to the learner. The process of identifying and studying filters is used in order to optimize design in technology-rich learning environments in which possible negative effects due to filters can be alleviated through the design process [14].

The expectations and practices which are studied in this research project are understood to be intertwined in, combined and socially constructed by the collective practices, activities and cultures that are taking form in the organization. The uptake and use of digital technologies within the classroom is expected to drive changes and development in educational practice and perspectives over time. This is expected to occur at several different levels within the organization and with the influence of several factors [19]. By following the two schools as a collective oriented activity over time it may be possible to understand filters and changes within and between different components of the activities which occur through the uptake and use of digital technologies in a school context.

6 Method

The Unos Umeå project can be regarded as a 1:1 case study within the framework of a multiple case design [25]. All studies will be parallel and take place within both schools, in two classes in the compulsory school and two classes in the upper-secondary school. As the project is a joint project with the municipality of the Umeå, the schools have been chosen in dialogue with the municipality, while the classes have been chosen in cooperation with schools.

By definition the case study is a specific, holistic, often unique instance that is frequently designed to illustrate a more general principle. It can be described as an instance in action, as an evolving situation, or what it is like to be in a particular situation as observed through direct observation and interviews with the aim of the study to be to explain, describe, illustrate and enlighten [32] with research questions concerning how and why [32]. Elements of case study can be seen as providing a rich, vivid and holistic description, portraying events, context, and situation [3] with the focus being placed on the participants in the study with the aim of letting the data speak for themselves [23]. The purpose for this case study is to gain knowledge about how digital technologies are used in the classroom in practice in line with the research questions, and the different cases together will help to provide supplementary insight into different case-related issues. While case studies recognize and accept complexity, uniqueness, and unpredictability and can permit generalization and application to similar situations. In addition, case studies are written in an accessible style and are immediately intelligible [3].

The theoretical base for this text is that there are many different understandings of one and the same phenomena all of which are related to the observers' experiences and social context [30], [31], [8]. Knowledge and experience can be understood to be objective from the perspective of the subject [30], [31]. For this study, the data material will be comprised of surveys, interview, focus group interviews and ethnographically inspired classroom observations. Therefore, the empirical data in this study can be said to be threefold, as an attempt to achieve a more complex form of data material and thus a wider understanding of the 1:1 initiative in this specific context through triangulation [13].

7 Discussion

This research project will contribute to the research area TEL in several different organizational levels. Insights into how students and teachers build knowledge in learning practices in the classroom with the help of computers and how they experience changes in expectations and work methods in practice in the classroom will be in focus. Teacher collaboration and professional development will be examined as well as school leaders' expectations and school development. Moreover, how policy documents are implemented and affect the work in the classroom in practice and the school as an organization will be studied. This research project offers a unique possibility to study the learning practices through concrete work with digital technologies in school contexts. The data collected and findings both during and after

the project period may be substantial for students and teacher as well as for school development and learning, as the result will present in-depth and longitudinal studies. This will be of importance for schools which initiate similar projects by implementing digital technologies in the future, as well as for the research area which comprises the framework for this project. Along with findings related to learning practices, this dissertation related to the work in the Unos Umeå project may also contribute to knowledges and experiences for teachers' professional development as well as for school development, all of which are important areas of educational research.

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